EXPLORING TRANSFORMATIONS OF PARABOLAS (QUADRATICS)

Standard Form: $y = ax^2 + bx + c$

Play with the applet http://www.mathopenref.com/quadraticexplorer.html to answer the questions below:

1. What does changing the *a* value do to the parabola?
   a. If I make $|a|$ bigger, the parabola gets skinnier.
   b. If I make $|a|$ smaller, the parabola gets wider.
   c. What happens when *a* is negative? reflect over x-axis
2. What does changing the *c* value do to the parabola?
   shift up and down

Vertex Form: $y = a(x-h)^2 + k$

Play with the applet http://www.mathopenref.com/quadvertexexplorer.html to answer the questions below:

3. What does changing the *a* value do to the parabola? same as question 1
4. What does changing the *h* value do to the parabola?
   a. If *h* is positive, the graph shifts right. $(x-h)$
   b. If *h* is negative, the graph shifts left. $(x+h)$
5. What does changing the *k* value do to the parabola?
   shift ↑ ↓

Apply:

6. On the Standard Form applet, create the parabola $y = -3x^2 + 12$ reflected over x
   a. Describe the ways that this parabola is a transformation of $y = x^2$ skinnier, shift up
   b. Give the roots of the quadratic function.
7. Create the parabola $y = 0.5x^2 - 3x - 8$
   a. Describe how this parabola is a transformation of $y = x^2$
   b. Give the roots of the quadratic function.
8. On the Vertex Form applet, create the parabola $y = 2(x-4)^2 + 3$ skinnier, shift right, shift up
   a. Describe the three ways that this parabola is a transformation of $y = x^2$
   b. Give the vertex of the quadratic function. (4,3)
9. Create the parabola $y = -5(x+1)^2 + 10$
   a. Describe how this parabola is a transformation of $y = x^2$
   b. Give the vertex of the quadratic function.
10. What is the vertex of $y = -0.2(x+5)^2 - 4$? (-5,-4)
11. What is the vertex of $y = (x-8)^2 + 5$? (8,5)
12. Generalize: What is the vertex of $y = a(x-h)^2 + k$? (h,k)
13. Write the equation for a parabola that opens down, is skinnier than $y = x^2$, and whose vertex is (2,3).
14. Write the equation for a parabola that is wider than $y = x^2$, and whose vertex is (-5,7).

Name_____Date_____Block_____

CW - Transformations of Quadratic Functions

A. List the value(s) of a, c, h, or k in $y = a(x-h)^2 + k$
B. Describe how each of these values transforms the graph.

1. $y = 2x^2 - 4$

$a =$ 2.
skinnier

$c =$ −4
shift down 4 units

2. $y = -x^2 + 2$

$a =$ −1
reflect over x-axis

$c =$ 2
shift up 2

3. $y = -4x^2$

$a =$ −4
reflect over x-axis
skinnier

$c =$ 0
no change

4. $y = (x-6)^2 + 7$

$a =$ 1
no change

$h =$ 6 $k =$ 7
shift right 6 shift up 7
vertex (6, 7)

5. $y = (x+3)^2$

$a =$ 1

$h =$ −3 $k =$ 0
shift left 3 vertex (−3, 0)

6. $y = -3(x-2)^2 - 1$

$a =$ −3
reflected
skinny

$h =$ 2 $k =$ −1
right 2 down 1
vertex (2, −1)